AK 701
8/21/87
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MAPCO ALASKA PETROLEUM INC.
1100 H&H LANE
NORTH POLE, ALASKA 99705
(907) 488-2741

DEPT. OF ENVIRONMENTAL CONSERVATION
NRO
AUG 21 1987
RECEIVED

August 21, 1987

Mr. Larry Dietrick
Alaska Department of Environmental Conservation
Northern Regions Office Supervisor
P.O. Box 1601
Fairbanks, AK 99707

Dear Larry:

I have attached blue line markups and revised details per our August 18, 1987 meeting. I have submitted the markups to save time. If you will approve these drawings in this form and allow us to get the construction process going, we will submit a set of construction drawings as soon as they become available.

Thank you for working with us.

Very Truly Yours,

Ken Chrisman

KC:nn

cc: Carleta Lewis, City of North Pole
Doug Dasher, ADEC
Mike Silverman, EPA
Dave Rowse, MAPCO
Randy Maag, MAPCO
Jerry Fritz, MAPCO

FILE COPY

IMAGED

FLUOR

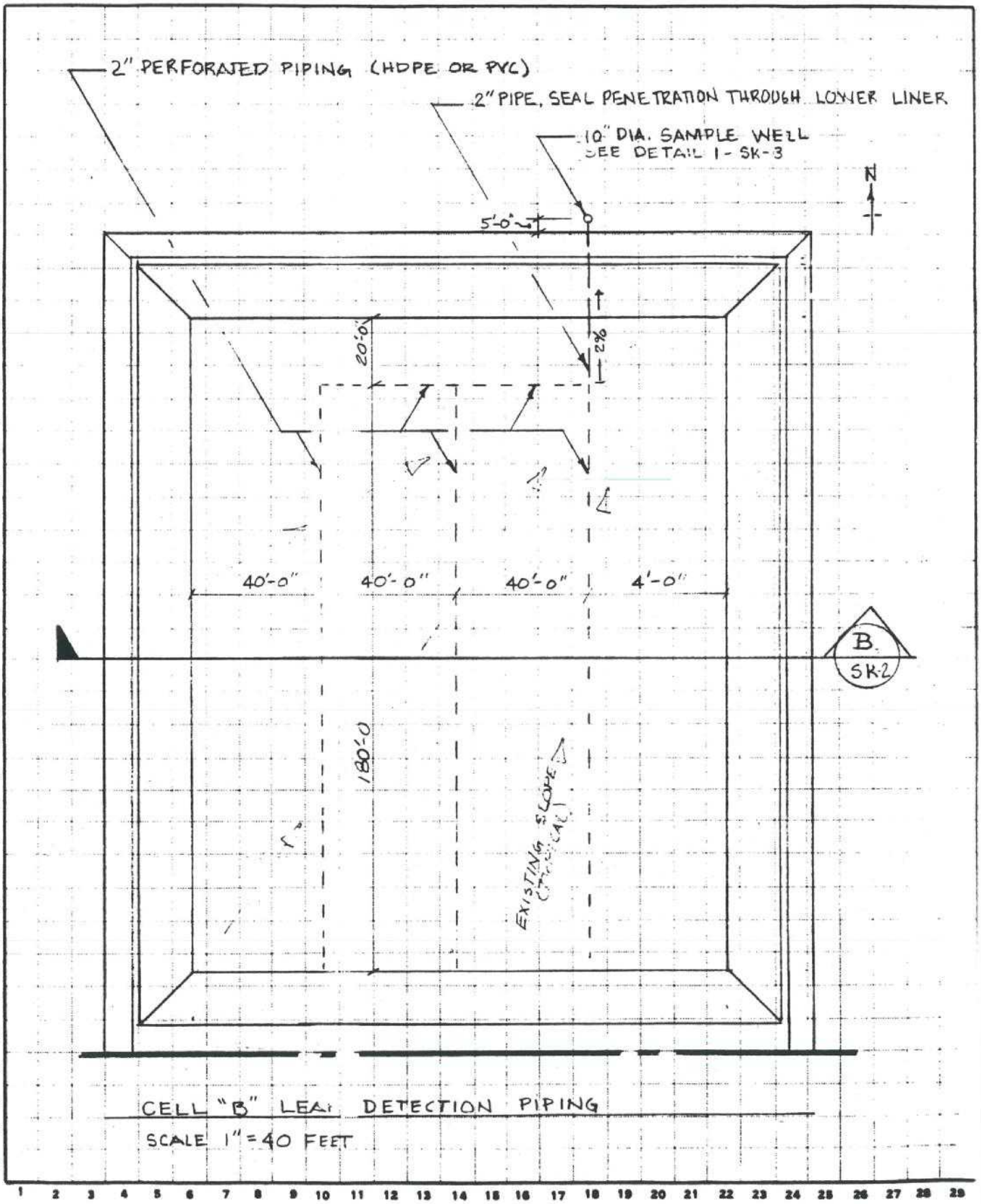
CALCULATIONS and SKETCHES

DATE AUG 20, 1987

CONT. NO.

BY GWP CHK'D

SHEET NO. SK-1



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FLUOR

CALCULATIONS and SKETCHES

DATE AUG. 20, 1987

CONT. NO.

BY GWP CHK'D

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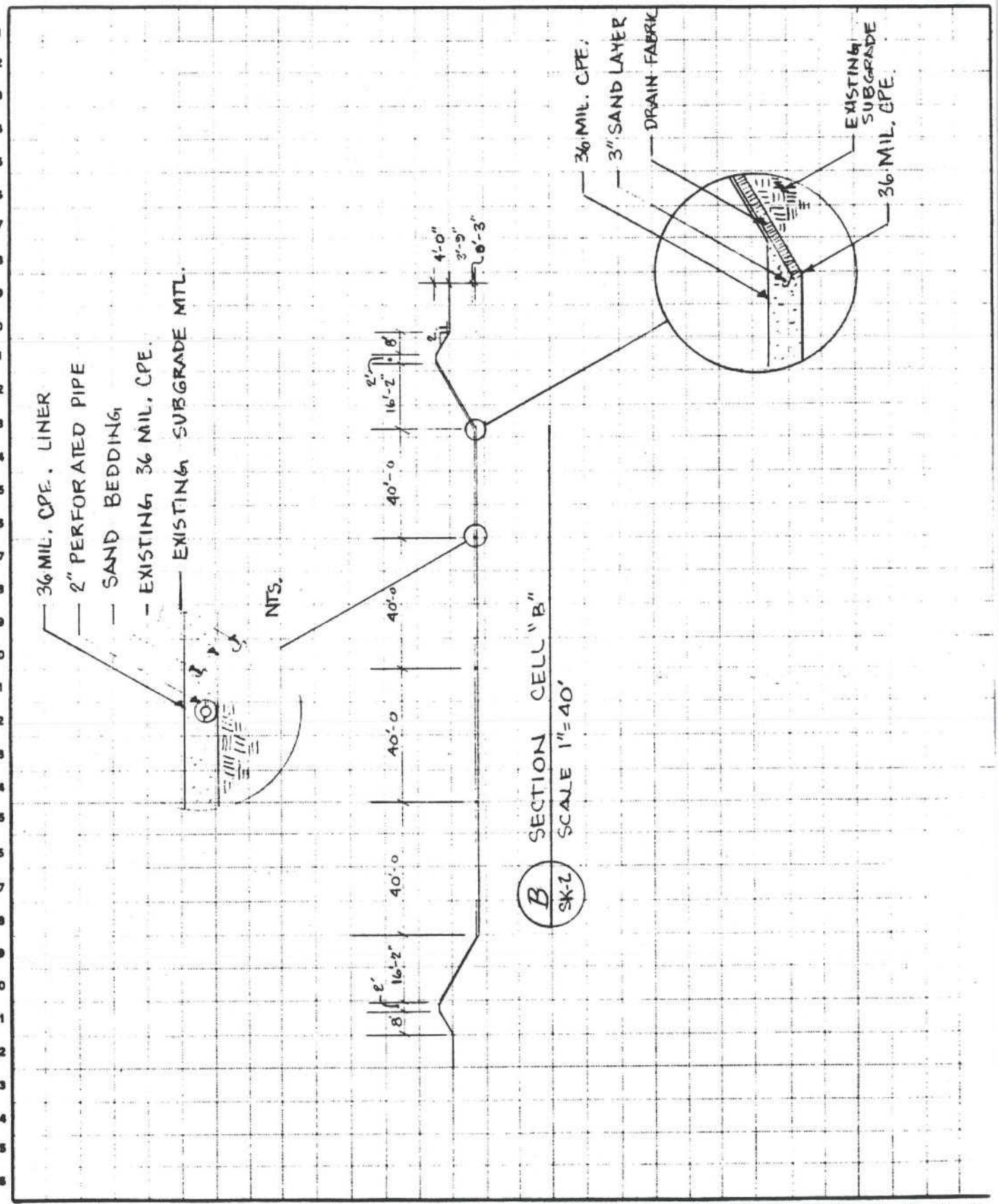

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CALCULATIONS and SKETCHES

DATE AUG 20, 1987
CONT. NO.
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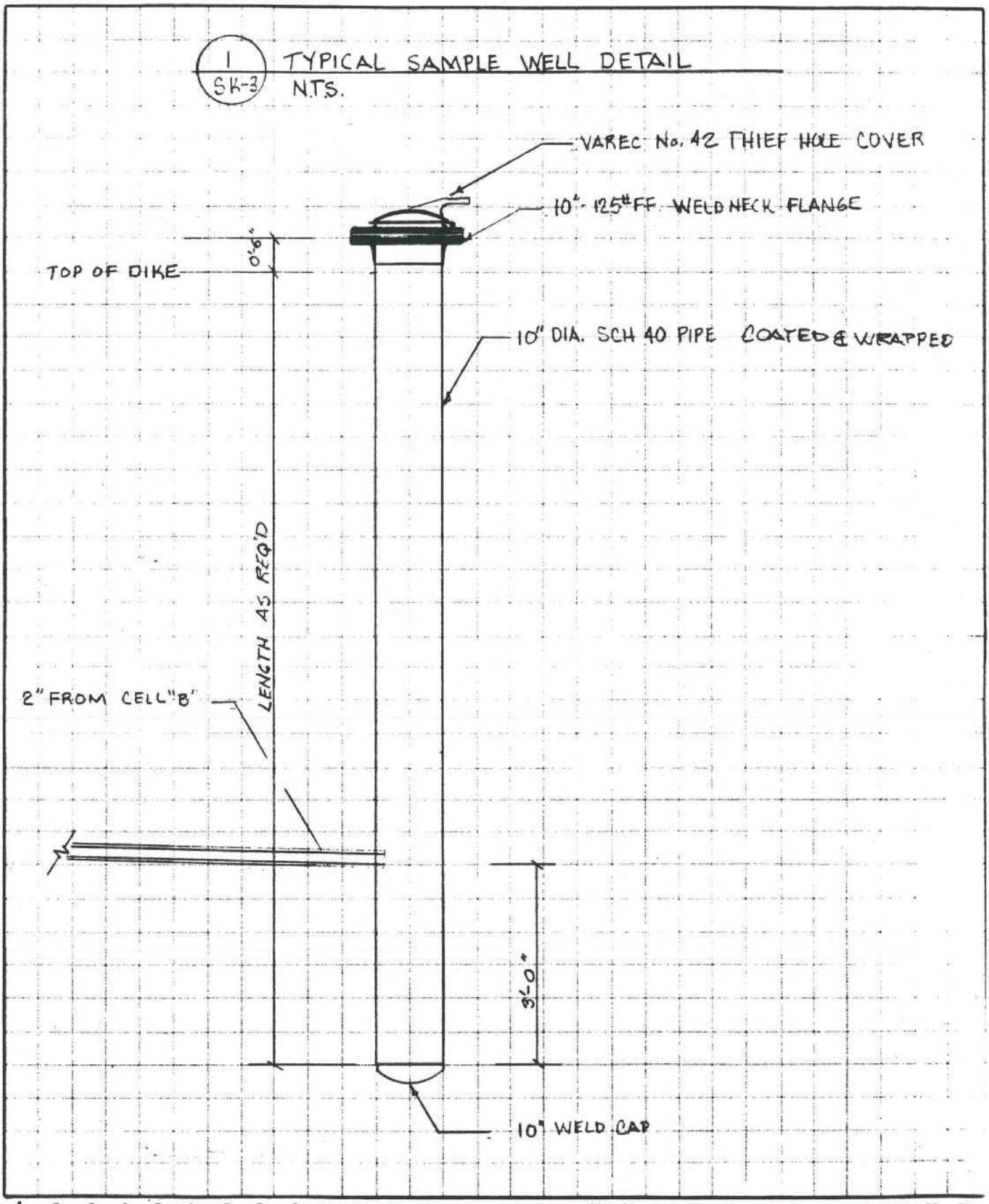

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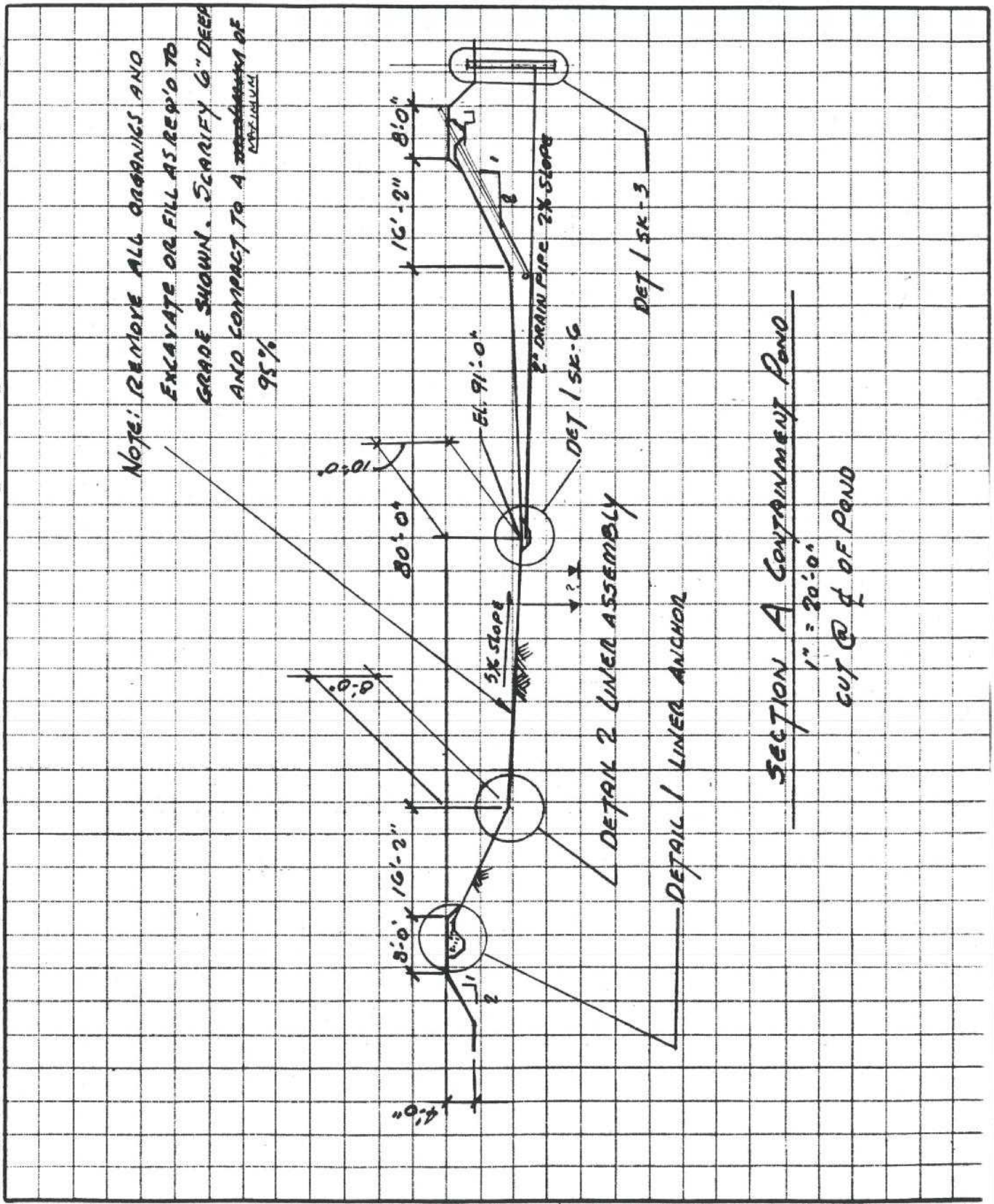
CALCULATIONS and SKETCHES

DATE AUG 20, 1987

CONT. NO.

BY CHK'D

SHEET NO. SK-4



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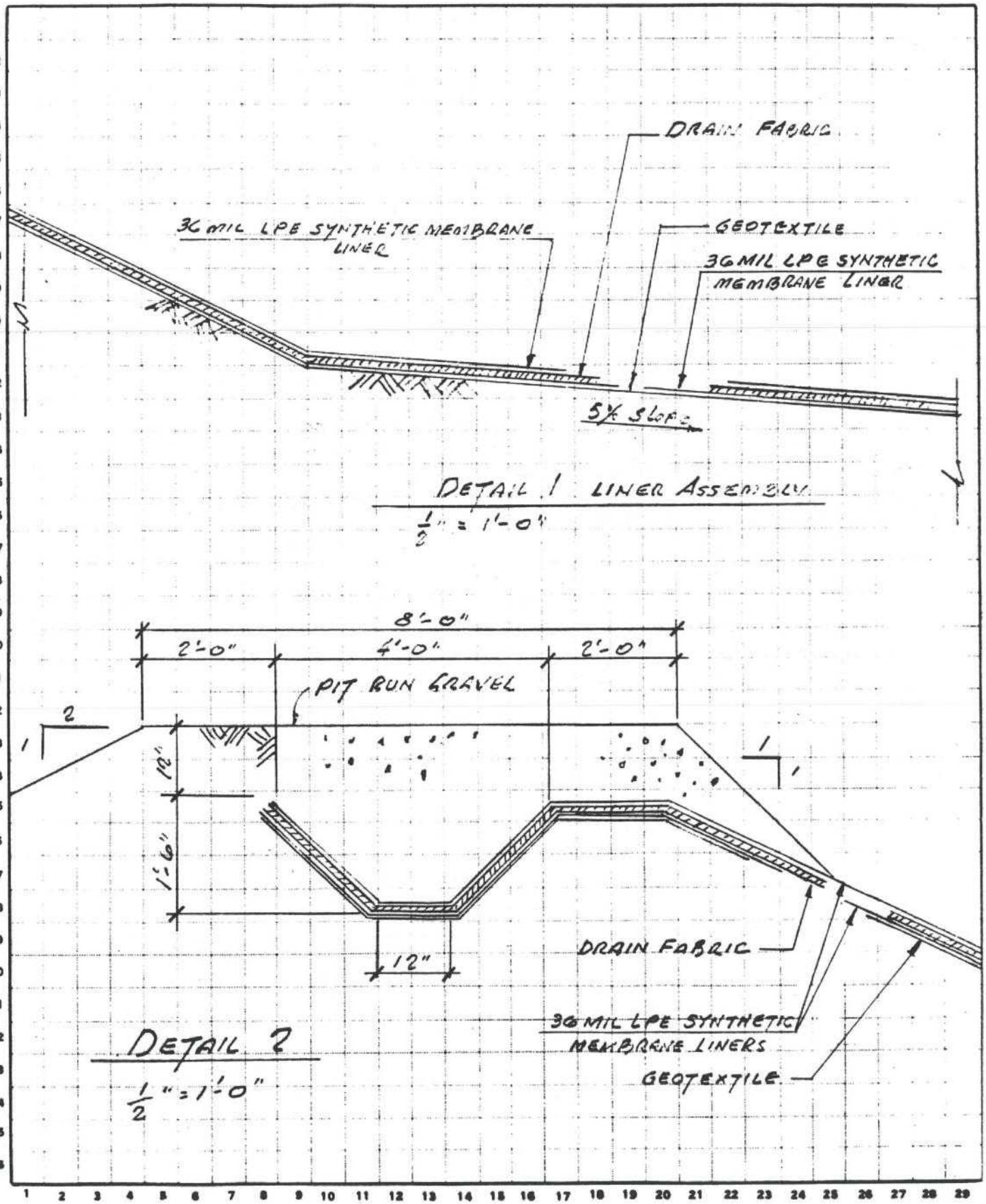
CALCULATIONS and SKETCHES

DATE AUG 20, 1987
CONT. NO.
BY CHK'D
SHEET NO. SK-5



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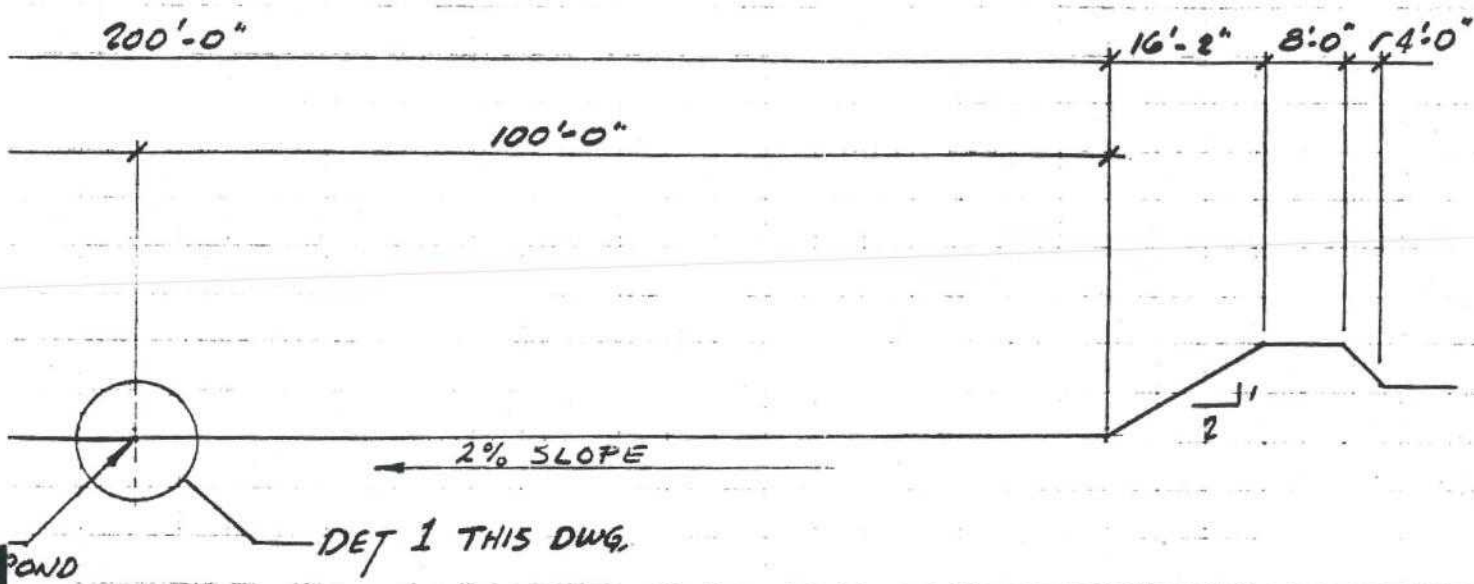

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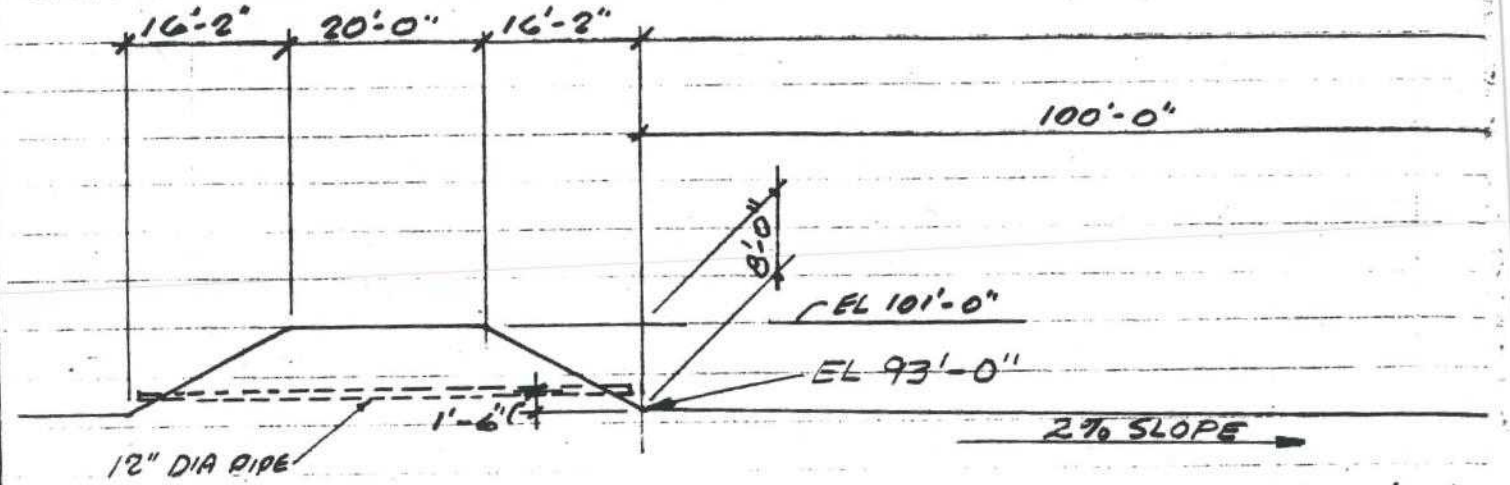

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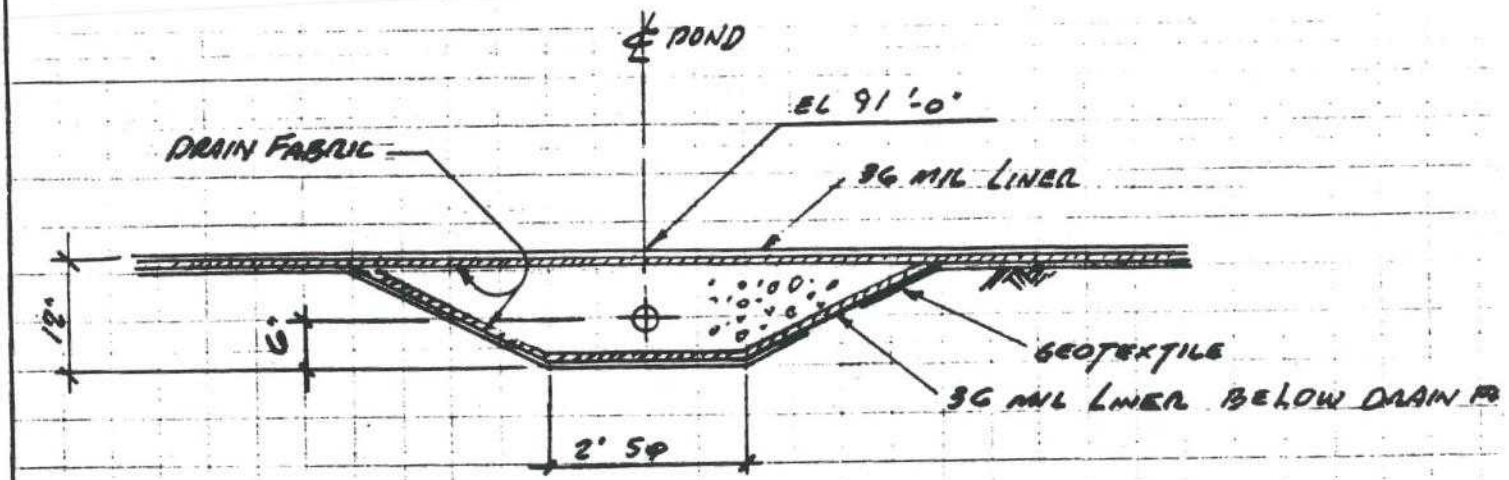

DETAIL 1
1/2" = 1'-0"

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CALCULATIONS and SKETCHES

DATE AUG 28, 1987
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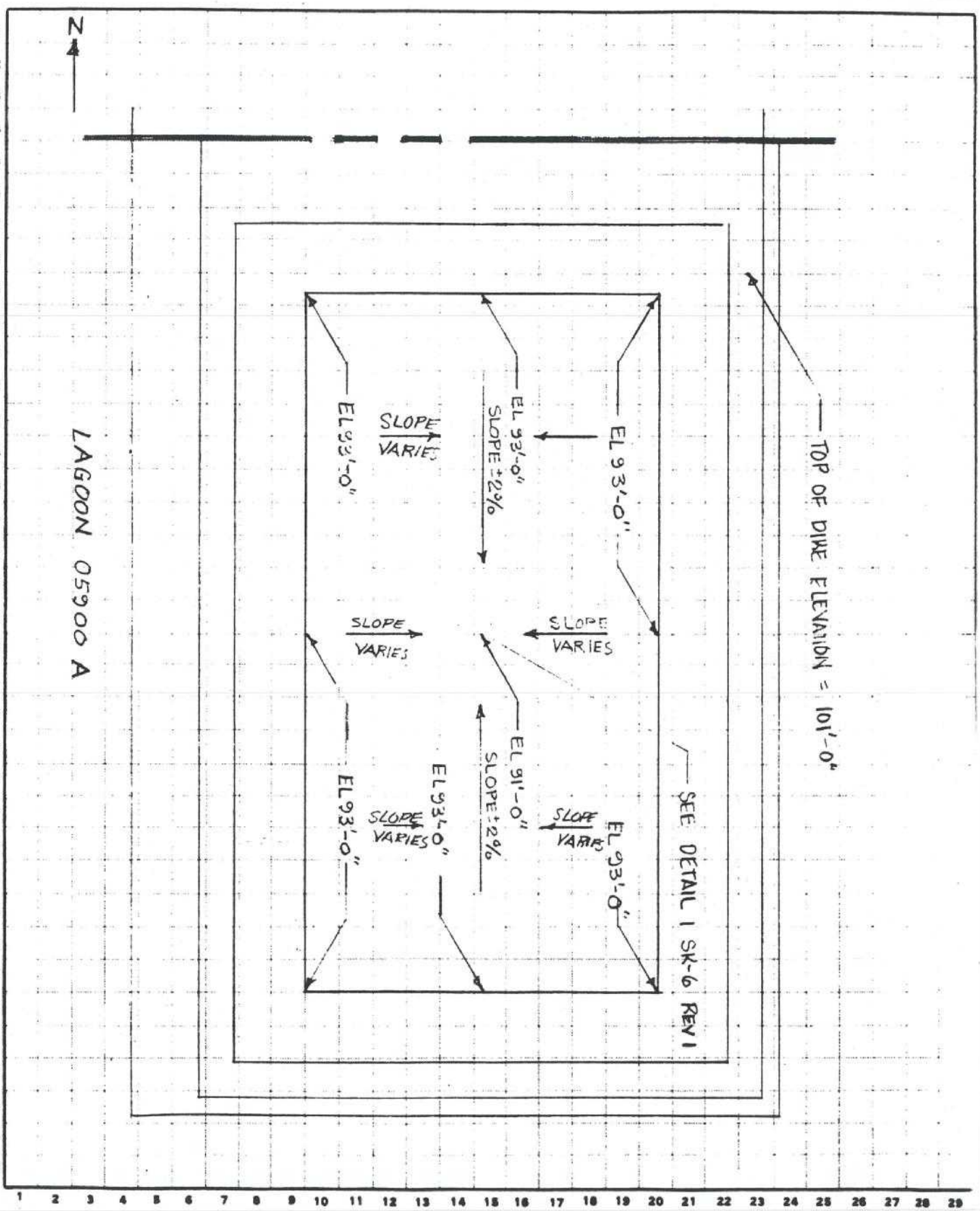
SHEET NO. SK-7



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AK 701

MAPCO ALASKA PETROLEUM INC.
1100 H&H LANE
NORTH POLE, ALASKA 99705
(907) 488-2741

LIST OF ATTACHMENTS TO 18 AAC 72.260 SYSTEM PLAN REVIEW LETTER
OF MAPI TO ADEC AUGUST 17, 1987

ATTACHMENT	18 AAC 72.260 SECTION COMPLIANCE
1. Process Description & Calculations.	(C)(2),(C)(5)
2. Schedule	(C)(4)
3. Location Drawings	(C)(1)
D-05-C1315 North Pole Refinery Location Plan	
D-01-F1342 Sump Location Plot Plan	
D-05-F1348 Supplemental Material Balance Data	
4. Process Flow Diagrams	(C)(2)
D-01-F1344 Sump & Waste Water Flow Diagram	
D-01-F1343 Waste Water Pretreatment System	
D-05-F1350 Waste Water Pretreatment System	
5. Piping & Instrument Diagram	(C)(2)
D-05-F1352 Waste Water Treatment Facility Water System	
D-05-F1351 Waste Water Treatment Facility Air System	
6. Roen Drawings	(C)(1)
D-05-C1333 Sewer Drawings	
D-05-C1334 Sewer Drawings	
7. Civil Drawings	(C)(1)
00-D-14022 Foundation Location Plan Storm Water Holding Pump	
00-D-14012 Paving & Drainage Plan Storm Water Holding Pump	
D-05-C1355 Waste Water Blower Building Foundation Plan	
D-05-C1356 Waste Water Paving & Drainage Details	

MAPCO ALASKA PETROLEUM INC.

NORTH POLE REFINERY

WASTEWATER PRETREATMENT PLANT

The following documents were prepared for release to the Alaska Department of Environmental Conservation as part of the Plan Review requirements of Title 18 Chapter 72 of the Alaska Administrative Code for the referenced project.

Brian G. Tomlinson

Brian G. Tomlinson
EC 4493
17 August 87

MAPCO Alaska Petroleum Inc.
Wastewater Pretreatment Plant

PROCESS DESCRIPTION

General

MAPCO Alaska Petroleum Inc. (MAPI) plans to install a wastewater pretreatment plant to upgrade refinery wastewater prior to discharge to the North Pole municipal sewage treatment plant. The Water System Piping & Instrument Diagram, Drawing No. D-05-F1352 describes the planned facilities. The following is a narrative description of the system.

About 50,000 gallons per day (gpd) of refinery wastewater that collects in sumps will be transferred to the 5000 barrel Oily Water Separator Tank, T-192. A demulsifier will be injected upstream of T-192 and a static mixer to enhance separation. T-192, on level control, will drain collected oil to T-192 Oil Sump, S-907. Oil will be pumped to storage for further processing. The water fraction from T-192, also on level control, will be pumped to Lagoon LAG-05900A (Lagoon A), the first stage of aeration. The nominal 1.248 million gallon lagoon will aerate the wastewater through each of 35 aerators rated at 15 cfm. The transfer pump from T-192 to Lagoon A is over-rated for the service but it is installed, operational, and will provide adequate distribution and mixing of the headworks of the lagoon. After undergoing aeration for a summer operation detention time of nearly 18.5 days in Lagoon A, Pump P-05206B transfer water from Lagoon A to LAG-05900B (Lagoon B). Again, P-05206B is over-rated for the service. However, it is in inventory and provides more than adequate energy for mixing as the headworks of Lagoon B.

Lagoon B has a nominal volume of 2.276 million gallons with a summer operation detention time of 28.5 days. The effluent from Lagoon B will drain into Sump S-909A from where it will be pumped to the city sewer located along H & H Lane.

Piping

Conventional refinery piping systems will be installed for the Wastewater Pretreatment Plant. Wastewater piping between T-192 and Lagoon A, for the most part, will be located aboveground in the east-west piperack or on sleepers. Piping will be welded carbon steel, glycol-traced, and insulated to assure a "tight", closed system. Similar piping will be installed for wastewater piping between lagoons and from Lagoon B to the city sewer, with

one exception. The final underground run of piping from the refinery to the city sewer will be of ductile iron pipe.

High density polyethylene pipe will be used for the following service:

- Distribution and collection headers for the lagoons; and
- submersed air piping.

The piping will be manifolded to divert flow from Lagoon B to Lagoon A, should the need arise.

Instrumentation

Instrumentation for the Wastewater Treatment Plant consists of the following:

- Flow transmitter to indicate flow from the plant sumps;
- Level alarms and transmitter in T-192 to operate solenoid dump valve SV-05507 to flow accumulated oil into Sump S-907 for further processing at the refinery;
- Level alarms and transmitter in T-192 to operate P-05205 which controls flow from T-192 to Lagoon A;
- Flow transmitter in influent line to indicate flow;
- Flow control valve and totalizer on effluent line leaving Sump Pump in S-909A. A minimum flow rate of 20 gpm will be maintained in the discharge to the city sewers;
- A flow switch (FS-05526) will sense incoming flow to Lagoon A and will simultaneously activate the inter-lagoon transfer pump. Since these pumps are not matched, flow will be balanced manually in either of two ways: a globe valve on the discharge from the pump or adjusting the valve in the interconnecting 12 inch pipe between lagoons;
- Level transmitters and indicators on each sump;

- o Temperature indicator/transmitter on discharge line;
- o Level gauges on oil-water/water-oil interfaces for T-192;
- o Relief valves on blower discharge lines; and
- o pressure indicators on the blower discharge and on all the pump discharges.

Process Data

Lagoon B has been in existence since the refinery started up. For ease of process flow, it was determined that it should be used as the final treatment cell. The design criteria that were used to size lagoons and blower systems are a combination of results of laboratory analyses and design methods addressed in EPA's Cold Climate Utilities Design Manual. Bench scale tests indicate that the wastewater is treatable with no toxic effects. The following table summarizes design criteria:

	Influent	Discharge
Average Daily Flow (gpd)	52,000	52,000
BOD (mg/l)	1,100	200
BTX (ug/l)	37,200	100
TSS (mg/l)	190	70
Oil & Grease (mg/l)*	17.3	100
pH	6.0-9.0	6.0-9.0
Conductivity (micromhos/cm)	less than 10,000	less than 10,000

*highest recorded in Lagoon B sample

A possibility existed for MAPCO to purchase surplus blowers. Also, Lagoon A geometry had to fit plot space and room for the Blower Building. Considering the following assumptions, subsequent active volumes, detention times, air requirements, and effluent BOD are:

	Winter	Summer
Assumed Ice Cover, Freeboard and/or Sludge (ft.)	3.0	1.5
Active Volume - Lagoon A (gals)	707,000	964,000
Active Volume - Lagoon B (gals)	1,050,000	1,480,000

	Winter	Summer
Detention Time (days) - Lagoon A	13.6	18.5
Detention Time (days) - Lagoon B	20.2	28.5
Air Requirements - Lagoon A (cfm)	155	200
Air Requirements - Lagoon B (cfm)	60	34
Eff BOD - Lagoon A (mg/l)	379	178
Eff BOD - Lagoon B (mg/l)	99	20

The effluent BOD for Winter and Summer operation, accordingly, should meet the 200 mg/l discharge criteria. Another criterion of concern is BTX concentration. the maximum reported concentration in Lagoon B was 37.2 mg/l. Since BTX are so volatile, discounting the potential biochemical reduction, the ratio of oxygen to BTX 52.2 moles of oxygen to 0.21 mole of BTX. In other words, the stripping ratio is about 250 moles of air to 1 mole of BTX. At this high of a ratio, the volatilization of BTX should be satisfactory to meet 0.1 mg/l BTX in the discharge to the city sewer.

Oil and grease (O&G) concentration is another parameter to be checked. A comparison of T-192 with API oil-water separation design criteria was made. Assuming an influent O&G of 1000 mg/l into T-192, to achieve a 100 mg/l (discharge limit) effluent, an 1176 gram throughput is allowed. The average daily flow through T-192 is 52,000 gallons on 36 gpm, 3% of the flow rate allowed. However, the instantaneous flow rate of 755 gpm is still 64% of the allowable.

A higher separation efficiency should be attained with T-192. The API separation criteria for a 25 mg/l O&G effluent requires a flow rate of 345 gpm or less. It is unlikely that sustained flows of the instantaneous maximum will occur frequently. Also, emulsion breakers assist in the oil-water separation process. Therefore, the discharge limitation of 100 mg/l O&G should be met easily.

Conductivity and pH have proven to be in line with discharge limitations (10,000 micromhos/cm and between 6.0 and 9.0, respectively). Therefore, they are not expected to be of concern.

MAPCO's present total suspended solids' (TSS) discharge limitation is 70 mg/l. The two-lagoon design accomplishes several tasks. One is the removal of gross solids in the first lagoon. Also, with this high of a concentration of BOD in the influent, the mixed liquor volatile suspended solids (MLVSS) will be high after aeration in Lagoon A. This will allow Lagoon B to act more as an aerobic digester to reduce the solids concentration prior to discharge.

Two other factors help trap solids in Lagoon B. it has twice the surface area and about the same number of aerators as Lagoon A. Therefore, the hydraulics of settling should be more favorable in Lagoon B.

Sludge Handling

An allowance for storing accumulated sludge was made in the basin active volume calculations. Assuming the following:

- All BOD converts to TSS on a pound for pound basis;
- Flow is 52,000 gpd;
- All BOD is converted to TSS; and
- Density of TSS is same as water;

then:

TSS generation rate due to MLVSS is about 21,000 gallons per year or about 1% of the active winter volume of both lagoons combined.

MAPCO will allow the settled solids to accumulate to a manageable level prior to withdrawal. At that time, analyses will be performed to determine its level of inertness. Depending on analytical results, a request will be made to either spread the solids in an area within the refinery for landfarming, blend into tank form dike cover materials, or haul them to an approved disposal site.